Atlantic Marine Center Electromechanical Cable Requirements

Introduction:

The Atlantic Marine Center uses electromechanical cable to lower various scientific instruments over the side of their oceangoing research vessels. The cables support the instruments and provide the means for electrical signals to pass between the instruments and the vessel. It is typically called "CTD wire".

The following specifications describe in general terms the significant characteristics the cable design must have. No priority is implied by the order given.

General:

An electromechanical cable is required to lower various scientific instruments over the side of an oceangoing research vessel. The cable shall be capable of safely lowering an instrument to 5,000 m water depth in the dynamic environment caused by ship and wave motion, and lowering/raising speeds of 52 m/min. Multiple conductors are required for the real time transmission of electrical data and control signals and for redundancy. The cable shall be capable of being stored under tension for five years on single drum winches to multiple layers. Resistance to crushing is required. It is expected that payloads will frequently produce loading of the cable (both static + dynamic) approaching 50% of rated breaking strength (RBS).

The cable will be used with LEBUS grooved drum shell. The cable must be compatible with existing LEBUS grooved shells for a Markey DESH-5 winch. As listed below:

General:

An electromechanical cable, Rochester Corporation, part number A305678 or equivalent.

Characteristics:

1) Finished Diameter: - The finished diameter shall be 8.1788 mm (0.322") at a loading of 15% of RBS. The diameter shall be uniform over the length of the cable with tolerances of (0.0508 mm (0.002") and +0.076 mm (0.003")).

2) Working Diameter: - The change in cable diameter due to a change in cable loading shall not exceed 2% of the finish diameter. At a loading of 50% RBS the cable diameter shall not be less than 8.03 mm (0.316)".

3) Rotation: - The finished cable should not rotate about its axis more than 49 degrees per meter at 40% of RBS. It is recognized that this requirement may not be met given the specified outer armor wire size and minimum sheave diameter.

4) Rated Breaking Strength: - > 4500 Kg (10000 lbs) with one end free to rotate.

5) Flexure Tolerance: - Withstand > 50,000 flexure cycles over sheaves 40 times wire O.D. at 35-40% of RBS without failure of individual wires or degradation of electrical performance. Degradation in strength shall not exceed 5% of RBS.

6) Tension Cycling: - Withstand > 50,000 cycles in tension from 10% to 40% of RBS at an 8 sec. period without failure of individual wires or degradation of electrical performance. Degradation in strength shall not exceed 5% of RBS.

7) Sheave Size: - The cable shall be capable of operation with sheaves of tread diameter 38 cm (15").

8) Cable Length: - The cable shall be of an unbroken length of 10,010 m without splices. One length of 10,000 meters shall be delivered and 10 meters shall be used by manufacturer for the test required in the Reports section of this specification.

9) Armor Wires: - The armor wires shall be galvanized and have the following characteristics:

Tensile Strength: > Extra Improved Plow Steel
Ductility: > of XIPS
Armor: both inner and outer armor wires to have a diameter > 0.813 mm (0.032") SGXXIPS

10) Belt: - The conductor package shall be jacketed with 0.381 mm (0.015") Hytrel to protect the conductors from armor abrasion.

11) Marker Tape- The cable will have a marker tape denoting the cable length in 1 meter increments.

12) Electrical: - The cable shall be constructed with 3 stranded copper wire conductors sized #19 AWG 19/0.203 mm (0.008") bare copper with 0.406 mm (0.016") wall polypropylene is preferred, each of which shall have the following electrical characteristics:

Conductor Resistance:	< 32.8 ohms/1000 m. (10 ohms/1000 ft.)
Armor Resistance:	< 7.9 ohms/1000 m.(3 ohms/1000 ft.)
Capacitance:	115 pf/m. (40 pf/ft.) at a frequency of 1 kHz.
Voltage Rating:	> 1000 VDC
Insulation Material:	Copolymers of Polypropylene,Polyethylene or Ethylene Propylene
Insulation Resistance:>	3,000 Gigaohms/1000 m. (10,000 Megohms/1000 Ft.)

Color Coding: One each conductor wires of Red, White and Black

13) Yield Strength: - Construction shall be such that the conductors shall not yield at a cable loading equal to 70% of RBS.

14) Lubrication: - The cable shall be lubricated with Grignard Stran-Core or equivalent for abrasion and corrosion protection at the armor closing process during manufacture. The lubricant shall be of a low viscosity, water displacing type that does not extrude in use.

Reports:

The cable shall be delivered with a report demonstrating the cable's ability to meet the above specifications. The reports shall include, but not be limited to:

1. Electrical characteristics.
2. Length, weight, RBS both fixed end and one end free, other mechanical characteristics.